**Content Outline**

**Unit Title:** Cell Membrane and Cell Transport

This unit will allow students to examine the composition of the cellular membrane, the various methods that allow atoms and molecules to move in and out of the cell, and the mechanisms that allow molecules to move within the cell.

**Conceptual Outcomes:**

By the end of this unit, students will be able to explain the composition of the cellular membrane and its importance in regulating the transport of atoms and molecules in and out of the cell. The students will understand the concepts related to intercellular transport including the various methods of passive and active transport as well as the concepts related to intracellular transport and the associated organelles, including the endoplasmic reticulum and Golgi apparatus. The students will also explain how cellular transport allows the cell to maintain homeostasis.

**Related Content Standards:**

* **PDE SAS**
  + BIO.A.2.2: Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e. atoms, molecules, and macromolecules)
  + S11.A.1.1.5: Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).
  + S11.A.3.2.3 Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).
  + S11.B.1.1.1: Explain how structure determines function at multiple levels of organization (e.g., chemical, cellular, anatomical).
  + S11.B.1.1.3: Compare and contrast cellular processes (e.g., photosynthesis and respiration, meiosis and mitosis, protein synthesis and DNA replication).
  + S11.A.1.3.2: Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).
* **National Science Education Standards**
  + Standard A: As a result of activities in grades K-4, all students should develop:
    - Abilities necessary to do scientific inquiry
    - Understanding about scientific inquiry
  + Standard C 1.1: Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

**Objectives:**

* Given an illustration of a cell membrane, the student will label all important structural features with 80% accuracy.
* Given a writing prompt, the student will compare and contrast active and passive transport mechanisms with 80% accuracy based on a teacher-designed rubric.
* Given a list of cell transport mechanisms (osmosis, diffusion, exocytosis, etc.), the student will identify the type of transport (active or passive) and explain how the transport mechanism operates with 80% accuracy.

**Materials and Resources:**

* Teacher computer with PowerPoint projection system
* Cell membrane PowerPoint with student handouts
* Bubble lab activity supplies (see lesson 1)
* Passive transport PowerPoint with student handouts
* Passive transport videos
* Osmosis/diffusion graphic organizer
* Gummy bear lab activity handouts and supplies (see lesson 2)
* Osmosis and diffusion student lab sheets
* Osmosis and diffusion Venn diagram handouts
* Passive transport graphic organizer
* Osmosis and diffusion lab supplies (see lesson 3)
* Active transport PowerPoint with student handouts
* Active transport graphic organizer
* Cell transport mock court case student handouts
* Homeostasis PowerPoint with student handouts
* Cell transport review videos
* Plant cell transport lab handouts and supplies (see lesson 6)
* Microscopes
* Student computers (approximately 24) with internet access
* Diffusion, osmosis, and active transport web activity student handouts
* Cell membrane and transport unit project student handouts and rubrics
* Cell membrane and transport project supplies (see lesson 8)

**Overview of Lesson Topics:**

* **Lesson 1:** Cell Membrane Structure
  + PowerPoint notes
  + Bubble Lab Activity
* **Lesson 2:** Passive Transport (Diffusion, Osmosis, Facilitated Diffusion)
  + PowerPoint notes
  + Graphic Organizer
  + Set up gummy bear osmosis/diffusion lab
* **Lesson 3:** Osmosis and Diffusion Lab Activity (Ward’s Science Kit)
  + Osmosis/diffusion videos
  + Osmosis/diffusion Venn diagram
  + Passive transport graphic organizer
* **Lesson 4:** Active/Bulk Transport (Exocytosis, Endocytosis, Ion/Molecular Pumps)
  + PowerPoint notes
  + Active transport graphic organizer
  + Finish gummy bear osmosis/diffusion lab
* **Lesson 5:** Homeostasis
  + PowerPoint Notes
  + Cell Transport Mock Court Cases
* **Lesson 6:** Cell Transport in Plants – Elodea Salt Water Lab
* **Lesson 7:** Cell Membrane and Transport Webquest
* **Lesson 8:** Unit Review / Cell Membrane and Transport Project